



The Belt and Road Initiative and Dynamics of Structural Transformation

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Abstract

Structural transformation is among the core questions in development economics, but in recent decades, the discipline has shifted its focus away from production and transformation in favour of analyses on exchange, growth and productivity. Yet, the structural transformation question remains central, and needs to be confronted with the main changes in the global economic and political landscape, such as the emergence of the Belt and Road Initiative (BRI). With its emphasis on an infrastructure-based connectivity agenda, the BRI opens the space for a paradigm shift in development, and for a renewed emphasis on structural transformation. This article introduces a special issue that explores the role of the BRI in promoting structural transformation in low- and middle-income countries, to understand if and under which conditions the BRI creates pathways that can change the structure of the economies. Through an explicit focus on the role of BRI on transformation in low- and middle-income countries, this special issue examines how domestic institutions regulate and coordinate production diversification, national and international sectoral specificities, and drivers and barriers to technological innovation and trade. In this sense, the special issue sheds light on new conceptualisations and empirical examples of industrial policies.

Keywords One Belt One Road · Infrastructure · Upgrading · Industrialization

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Resumen

La transformación estructural es una de las cuestiones centrales en la economía del desarrollo. Sin embargo, en las últimas décadas, la disciplina ha desviado su enfoque de la producción y la transformación, a favor del análisis sobre el intercambio, el crecimiento y la productividad. Aún así, la cuestión de la transformación estructural sigue siendo central, y necesita ser confrontada con los principales cambios en el panorama económico y político global, como la aparición de la Iniciativa de la Franja y la Ruta (en inglés : « Belt and Road Initiative », BRI). Con su énfasis en una agenda de conectividad basada en infraestructuras, la BRI abre el espacio a un cambio de paradigma en el desarrollo, y a un renovado énfasis en la transformación estructural. Este artículo introduce un número especial que explora el papel de la BRI en la promoción de la transformación estructural en los países de ingresos bajos y medios, para entender si - y bajo qué condiciones - la BRI crea trayectorias que pueden cambiar la estructura de las economías. A través de un enfoque explícito en el papel de la BRI en la transformación en los países de ingresos bajos y medios, este número especial examina cómo las instituciones domésticas regulan y coordinan la diversificación de la producción, las especificidades sectoriales nacionales e internacionales, y los impulsores y barreras a la innovación tecnológica y el comercio. En este sentido, el número especial aclara nuevas conceptualizaciones y ejemplos empíricos de políticas industriales.

Résumé

La transformation structurelle est parmi les questions centrales en économie du développement, mais ces dernières décennies, la discipline a déplacé son focus loin de la production et de la transformation, en faveur d'analyses sur l'échange, la croissance et la productivité. Pourtant, la question de la transformation structurelle reste centrale, et doit être confrontée aux principaux changements dans le paysage économique et politique mondial, tels que l'émergence de l'Initiative Route et Ceinture (en anglais, « Belt and Road Initiative », BRI). Avec son accent sur un agenda de connectivité basé sur l'infrastructure, la BRI ouvre l'espace pour un changement de paradigme dans le développement, et pour une emphase renouvelée sur la transformation structurelle. Cet article introduit un numéro spécial qui explore le rôle de la BRI dans la promotion de la transformation structurelle dans les pays à faible et moyen revenu, pour comprendre si - et dans quelles conditions - la BRI crée des voies qui peuvent changer la structure des économies. À travers un focus explicite sur le rôle de la BRI dans la transformation des pays à faible et moyen revenu, ce numéro spécial examine comment les institutions domestiques régulent et coordonnent la diversification de la production, les spécificités sectorielles nationales et internationales, et les moteurs et les obstacles à l'innovation technologique et au commerce. En ce sens, le numéro spécial éclaire de nouvelles conceptualisations et des exemples empiriques de politiques industrielles

JEL codes O10 · O11 · O12 · O13 · O14 · O16 · O18 · O18 · O19 · O25 · O43



Introduction

Structural transformation (ST) is among the core questions in development economics. In the early days of the discipline, the shift from a predominantly agrarian economic structure to a more modern economy, based on high-value secondary and tertiary sectors, and the capabilities and innovation that are necessary to promote it, was a central subject of study. Today, this focus has been lost in favour of analyses on growth and productivity. The neoclassical economic framework, prevalent in recent decades, has shifted the attention away from ST towards market-based policies and a focus on exchange rather than on production (Chang and Andreoni 2021). Yet, ST remains central to the development process, and needs to be re-assessed in the context of the landscape that low- and middle-income countries (L&MICs) face today. In particular, the ST question needs to be confronted with the main changes in the global economic and political landscape, such as shifts in global value chains, ‘reshoring’ and ‘deglobalisation’ trends, new forms of industrial policy and global capital flows under frameworks such as the Belt and Road Initiative (BRI). The BRI has reconfirmed China’s outward strategy, which for many years already has focussed on fostering infrastructure and economic connectivity among countries. China’s own development path has involved a deliberate strategy of ST through reallocation between sectors, high levels of investment and significant efforts towards strengthening research and development (R&D). The BRI’s emphasis on infrastructure-based connectivity opens the space for a paradigm shift. Implicitly modelled as an extension of the Chinese development experience to other countries (e.g. see Wang and Lin 2017), the BRI offers an opportunity to deploy patient capital to build infrastructure and strengthen domestic production capabilities. Whether this opportunity materialises depends not only on the political and economic forms and drivers of Chinese capital, but also on the domestic economic and political economy conditions that this capital finds. Nevertheless, it is undeniable that the BRI, and Chinese economic engagement with the Global South more broadly, is shaping the development agenda and can reveal important insights into the contemporary challenges and mechanisms of ST. Since the launch of the Initiative, Chinese institutions have deployed hundreds of millions of dollars in aid and lending, and the BRI remains a force to contend with given its large size compared to competing initiatives such as the EU Global Gateway and the G7 Partnership for Global Infrastructure and Investment.

This article introduces a special issue titled ‘The Belt and Road Initiative and dynamics of ST’. It has been argued that much of the research around the BRI focuses on breadth rather than depth (e.g. see World Bank 2019), covering many issues and geographies but not digging deeper into specific questions (Blanchard 2021). In this special issue, we aim to correct this by examining the BRI in relation to ST. Specifically, the articles in this special issue address the following question: to what extent and how does the BRI, through infrastructure, trade, investment and finance, contribute to ST in L&MICs?

In this introductory article, we first look at what the BRI is, and how we understand it in the context of this special issue; we then look at the literature



that has identified ways in which the BRI has shaped development dynamics; we then examine ST and its drivers; and we consider how the BRI and ST are linked. Finally, we provide an overview of the articles included in this special issue, whose depth and wealth of data shed light on how the BRI, and economic engagement with China more generally, have contributed to, or hindered, ST in host countries.

This issue takes an explicitly heterodox approach to transformation. In contrast to neoclassical economics which does not distinguish between different types of productive structures, production and technology play a central role in heterodox economics (Reinert 2007, Ch.1). Therefore, Furthermore, while the neoclassical approach emphasises static equilibria and sets the basis for the need of unregulated markets, heterodox approaches provides a more appropriate framework for analysing ST which is premised on the importance of differences between space- and time-specific types of productive activities in explaining the development process and on the need for state industrial policy to shape them. Heterodox approaches recognise that economies are not based on the unrealistic assumption of perfectly competitive unregulated markets, but rather acknowledge the reasons behind distortions to spur investment in added-value industries hence productivity. Articles in this special issue consider not only changes in the economic structure of countries but also how production, capabilities and technology contribute to these changes.

What is the BRI?

“If you want to get rich, build a road first” goes the Chinese proverb, building a narrative that underpins the expansion of Chinese-financed infrastructure. In fairness, while exceptionally high levels of investment and gross capital formation were certainly the key drivers of the Chinese economic miracle, other factors accompanied and enabled them, such as the gradual reforms in the agriculture and industrial sectors, the importance placed on innovation (enabling both the adoption of foreign technology and strong domestic support for research and development activities), the demographic dividend and the participation to globalisation, in particular in the form of China’s accession to the World Trade Organisation, which fuelled export-led industry (Naughton 2018).

High levels of savings and investment in the Chinese economy enabled the accumulation of capital in search of productive use since the economic reform, but China has been a provider of infrastructure finance for much longer than that. Since 1949, financing infrastructure abroad was part of the foreign policy of the People’s Republic of China; and while this outward orientation decreased in the early years of Deng Xiaoping’s economic reforms (late 1970s, early 1980s), it resumed in the early 1990s when the reforms started to bear fruit (Strange 2023). This is why many scholars consider the BRI as an extension of a longer trend in foreign and economic policies that include other initiatives such as the Great Western Development Campaign, the Strategy for the Rise of Central China and the Northern



Revitalization Strategy, and finally the ‘Going Out’ strategy, which supported the overseas expansion of Chinese companies since the first years of the twenty-first century (Johnston 2019; Jones and Zeng 2019; Ferchen 2021).

The impetus for launching a new programme came from conditions that materialised in the Chinese economy since the late 2000s. In response to the Global Financial Crisis, the Chinese government injected a four-trillion-yuan stimulus package (equivalent to US\$ 580 billion, or 14% of China’s GDP; Yu 2009) into the economy. This further exacerbated the investment-led growth model, and the overcapacity in the construction and construction materials sectors (Freeman 2020). The BRI emerged as a response to these domestic challenges. In addition to these economic drivers of the BRI, it should be noted that geopolitical and security factors, such as access to resources and strategic trade routes (Johnston 2019) also played a key role in shaping the initiative.

Earlier known in English as the One Belt, One Road (OBOR), the BRI was launched in 2013, when President Xi Jinping announced its two components: in September, in Kazakhstan, he called for a ‘Silk Road Economic Belt’ to connect China to Europe via Central Asia; and in October, in Indonesia, he announced the ‘Twenty First Century Maritime Silk Road’, to reach Europe via the Indian Ocean. Through the initiative, Chinese financial institutions are estimated to have disbursed around US\$ 600 billion in lending and aid (Parks et al. 2023), in addition to any trade and investment flows facilitated by or promoted under the BRI banner. Even though lending by Chinese policy banks has slowed down since 2017, and investment has plateaued in Africa and Latin America, other forms of finance (such as emergency rescue lending for countries whose economies have been affected by COVID-19) have been deployed (ibid.).

The BRI features five areas of cooperation: (1) policy coordination, which entails collaboration among governments; (2) infrastructure connectivity, to develop an infrastructure network among participating countries to facilitate transit; (3) unimpeded trade, which aims to remove investment and trade barriers; (4) financial integration, to expand the offer of financial services and improve financial systems; and (5) connecting people, which covers cultural and academic exchanges, media, tourism and medical cooperation, joint research, and so on (Liu and Dunford 2016). And while these five areas of cooperation are already very comprehensive, some argue, the BRI is “less bounded than such a list suggests” (Johnston 2019, p. 42), potentially coming to encompass other topics.

The continuity of the BRI with previous Chinese initiatives, as mentioned above, is evident in the fact that many pre-existing infrastructure projects and plans were ‘re-labelled’ as part of the BRI once the initiative was launched. Several projects in Central Asia such as the Kara-Balta oil refinery in Kyrgyzstan and the Pengsheng Industrial Park in Uzbekistan predated Xi Jinping’s launch of the BRI in 2013 but were subsequently integrated into the initiative (Owen 2020). Similarly plans for the Kenyan Standard Gauge Railway date back to 2011, while in Latin America, the Coca Codo Sinclair Hydroelectric project in Ecuador was awarded to Chinese contractors in 2009 and completed in 2016 before Ecuador signed a BRI MOU in 2018 (Jenkins 2021).



Despite this continuity with the past, the nature of the initiative has changed over time. Initially, the BRI focussed on Asia and Europe and included 64 countries along six original corridors in Asia, Europe, the Middle East and North Africa (Li et al. 2015). By 2023, however, the initiative included almost 150 countries across the globe, including over 100 LMICs (Belt and Road portal, no date). As the initiative evolved, its content did too, with the originally planned corridors taking different shapes to respond to the political realities on the ground,¹ but also with a recent emphasis on ‘greening’ capital flows under the BRI, and with the introduction of new concepts such as the Digital Silk Road or the Health Silk Road.

Changes in the nature of the BRI are also evident in the financing devoted to the initiative. The early years of the initiative saw a period of largesse where Chinese companies were involved in large-scale infrastructure projects, which in LMICs were often financed through lending by Chinese policy banks. This entailed a simultaneous export of Chinese capital, construction capacity and construction materials, which had all been in abundant supply since the four-trillion-yuan stimulus package provided by the Chinese government. However, this initial largesse only lasted a few years. The end of the commodity boom, which guaranteed some of the repayments, caused lending to slow down, until 2017 saw a decline in lending by the China Development Bank and Eximbank, while at the same time, several major challenges with repayments and debt restructuring helped popularise the (now debunked) debt-trap diplomacy narrative (more on this below). The Third Belt and Road Forum, held on the tenth anniversary of the initiative in 2023, confirmed the intention to pivot towards ‘small and beautiful’ or ‘small and impactful’ projects, moving away from infrastructure megaprojects towards smaller scale, but more impactful projects (Ray et al., 2021).

The lack of a clear definition makes the concept of the BRI hard to pin down. By design, the borders and boundaries of the initiative are not well defined, and to date there exists no official list of BRI projects. This leads to questions about what is and what is not part of the BRI. In the eyes of Western observers, this ‘vagueness’ is equated to opacity (Summers 2020). However, the lack of a clear definition of the BRI has been useful to those who have used the label to advance their particular interests (Yu 2017). For instance, Chinese state-owned enterprises, both central and at the provincial or municipality level who want to obtain permits or secure government funding are more likely to do so if they label their projects as part of the BRI (Ye 2019; Liu et al. 2020a).

The question “What is the BRI?” remains critical to those who seek to analyse the initiative. A pragmatic approach adopted by most researchers has been to include a wide variety of activities under the BRI label. In some cases, this has meant that any infrastructure project along the BRI corridors is considered part of the BRI (e.g. Ruta et al. 2019); in some others, the BRI has come to include not only infrastructure but more broadly any manifestation of Chinese capital (e.g. Calabrese and Wang 2023).

¹ For instance, early plans for a Bangladesh–China–India–Myanmar Economic Corridor were replaced by a China–Myanmar Economic Corridor due to China’s frustration over the slow progress of the discussions and India’s opposition to the BRI (Calabrese and Cao 2021).



In this Special Issue, we do not seek to define what is part of the BRI. In line with the intended vagueness of the initiative, we do not seek to stigmatise it as something undefinable, and therefore unintelligible; rather, we understand the label as opportunistic, and instead we focus on the relational aspects of the dynamics between China and the host countries. In this sense, our focus is on Global China, in the sense of “understanding [...] China beyond the Chinese borders” (Lee 2022, p. 313) and more precisely, how it affects development dynamics in the host countries. In line with this view, the articles in this Special Issue take a broad approach, understanding the BRI as the variegated forms that Chinese capital takes in the host countries.

Development Dynamics of the BRI

Considering that the BRI has only been around for a decade, the number of articles, books and reports produced on it is impressive. This speaks volumes about the interest that the initiative has generated in academic and policy circles. In this review, we focus on the literature on BRI and development.

The most visible feature of the BRI is its contribution to global infrastructure development. Related to this is the role of patient capital, identified as one of the key aspects of China’s development cooperation. Given its long-term perspective as an enabler for economic growth, infrastructure development requires patient capital, which is more risk-tolerant and offers greater room for manoeuvre to the host countries (Lin and Wang 2017b; Kaplan 2021). Through this approach, the BRI can be more flexible to the host countries’ needs, in contrast with the one-size-fits-all prescriptions of the Washington Consensus. For instance, countries rich in natural resources but with little access to international financial markets can still borrow from China through infrastructure-for-resources loans (Zhang et al. 2019; Tang 2020).

The economic impacts of the BRI have largely been analysed under a neoclassical framework, with a focus on growth and international trade. Most of these studies have been *ex-ante* analyses (Bird et al. 2020; de Soyres et al. 2020; Lall and Lebrand 2020), looking at trade, using gravity models or estimating trade costs to understand the impact of the initiative (Zhai 2018; Baniya et al. 2020), or investment (Chen and Lin 2020). These, however, have relied on the assumption that BRI projects are fully implemented and operational. However over time, projects have been cancelled or changed, and the BRI has taken a new course, making these assumptions relatively unrealistic. More granular research on specific BRI projects has shown that the impact on growth has been limited. For instance, looking at the China-Pakistan Economic Corridor, announced in 2013, McCartney (2022) notes that the main impact has been in improving transport and logistics, and in giving a small stimulus to cement production; and Landry (2023) notes there was increased government spending in districts along the corridor, and that growth in those districts was related to government spending rather than to the corridor.

Many studies have looked at how the initiative plays out ‘on the ground’ (Oliveira et al. 2020), assessing its effects in specific geographies (see, for example, Camba



2020; Dwyer 2020; Mark et al. 2020; Calabrese and Wang 2023). Here, the focus is on specific, narrow impacts of the BRI, rather than on its contribution to the broader economic development process. Generally, the BRI is found to benefit some parts of society over others. Most BRI projects are negotiated by elites, and as such, they may only benefit certain groups in countries (Mohan and Tan-Mullins 2019; Abb 2023). In addition to highlighting the impacts of the BRI in certain geographies, these studies forcefully bring in the viewpoint of the host countries, highlighting their agency vis-à-vis China in shaping their own development process (Wissenbach 2020; Calabrese and Cao 2021; Walsh 2022).

Despite its breadth, this literature presents a gap. No study has looked at how the BRI supports changes in the *structure* of the host country economies—in other words if it promotes ST. This is exceptionally important for discussions on development, as ST, rather than any changes in GDP growth rates, entails durable progress over the long term. As the central question in development economics, this ought to be explored in the context of the BRI.

Structural Transformation and Development

Structural Transformation in Development Thinking

The idea that development entails a decline in agriculture's share of employment and output, while manufacturing's importance first rises and then falls in favour of services was already discussed in the seventeenth century by Sir William Petty (Clark 1957), and was later further expanded by many notable economists (Lewis 1954, 1955; Clark 1957; Kuznets 1966; Syrquin 1988), who wrote about the observed pattern of the reallocation of workers from traditional agriculture to 'modern' industry in Europe and North America and predicted a similar path for other developing regions.

A central tenet of development economics when it emerged as a sub-discipline in the years after World War II was that L&MICs were structurally different from developed countries and that they therefore needed a different type of economic analysis (Seers 1963). L&MICs were trapped in a process of negative cumulative causation (vicious circle) in which the economic structure led to low levels of income and limited growth reinforcing the existing structures. ST was seen as a way of breaking out of this vicious circle and stimulating economic growth. The existence of a large productivity gap meant that the transfer of labour from the low to the high productivity sector led to a significant increase in output. It was also argued that manufacturing holds a special role in growth because it is more able than other sectors to generate technological spill-overs and learning by doing, a positive contribution to the balance of payments and increasing returns to scale (Tregenna 2018, p. 444).

Prebisch (1950) and the Latin American structuralist school focussed on the centre-periphery relation as an explanation of the backwardness of the region and the need for ST (Kay 1989, Ch.2). They analysed the way in which the integration with the global economy led to deteriorating terms of trade and chronic balance



of payments problems. They also provided a structural explanation of inflation that challenged the orthodox monetarist view of the problem. Import substituting industrialisation was seen as a means of overcoming these problems, along with a range of other reforms.

During the 1950s and 1960s mainstream economics was dominated by one-sector growth models as pioneered by Solow, in which growth was explained by factor accumulation and exogenous technological change. These models by their nature, provided no scope for considering sectoral changes as a source of economic growth. This was not regarded as a problem since in theory neoclassical economics treats sectors as homogeneous in the production of values and spin-off effects (Tregenna 2018).

The “counter-revolution in development economics” (Toye 2018) marked the end of the idea that the economies of the Global South were structurally different from those of the North and needed a different type of economic analysis. As a result, ST changed from being central to thinking on economic development becoming marginal during the neoliberal period until its recent revival (Ocampo et al. 2009; Storm 2015; Chang and Andreoni 2021).

Heterodox economists continued to emphasize the importance of ST for development (see Amsden 1989; Wade 1990; Chang 1994, Foster-McGregor et al., eds., 2021). In Latin America neo-structuralism emerged in the 1980s and 1990s to challenge the dominant neo-liberalism of the period (Bitar 1988; Sunkel and Zuleta 1990). This approach incorporated evolutionary theories of technological change into the analysis of centre-periphery relations (Porcile 2021; Ffrench-Davis and Torres 2021). It led to a greater focus on the firm level and an understanding of the importance of technological capabilities and the mechanisms of technology transfer, dissemination, adaptation, and learning.

Another strand of heterodox thinking relevant to the analysis of ST has been the Global Value Chain (GVC) approach that analyses intra-sectoral (meso-level) and firm (micro level) changes.² GVC analysis focusses on the way in which globally integrated production is governed and evolves over time. In particular, the literature, through the conceptualization of *upgrading*, has emphasized that development via ST can also occur through other sectors.

Recently, mainstream economics has started to engage with issues of ST. At the theoretical level the development of multi-sectoral growth models opened the possibility of incorporating sectoral shifts into growth theory. Initially the models assumed a closed economy, but they were subsequently extended to include trade and input–output relations within GVCs (Sen 2023). Empirically the observation that many low-income countries were not industrializing but that resources were shifting to services led to a discussion of “premature deindustrialization” (Rodrik 2016; Tregenna 2016). The availability of new sources of data also stimulated interest in analysing ST at a disaggregated level (Gollin and Kaboski 2023).

² See Rohit (2023), Alessandria et al. (2024), Lectard (2019) for reviews of the literature on the ways in which integration into GVCs can contribute to ST.



Some mainstream economists have tried to combine insights from neo-classical and heterodox theories to analyse ST. Former World Bank chief economist Justin Yifu Lin has developed an approach that he terms the New Structural Economics.³ Lin argues that ST through industrialization is key to development but rejects the “comparative advantage-defying” approach of earlier structuralists. Instead, he proposes that countries should develop their productive sectors based on their “latent” comparative advantage.⁴ In this model, the role of the state is to provide hard and soft infrastructure and to facilitate industrial upgrading by removing barriers, market failures and information asymmetries that prevent countries from realizing their latent comparative advantage. Building infrastructure and facilitating the entry of foreign investment, highlighted by the New Structural Economics, were two important features of Chinese development (Aberg and Becker 2020).

Dani Rodrik and his collaborators have also developed an approach to economic development that combines elements of ST with neo-classical “fundamentals”. The fundamentals here refer to institutions as emphasized by the New Institutional Economics and/or human capital. He argues that rapid and sustained growth requires both ST and getting the fundamentals right (Rodrik et al. 2017).

Defining Structural Transformation

Herrendorf et al. (2014, p. 857) in their survey of Growth and Structural Transformation define ST narrowly as “the reallocation of economic activity across three broad sectors (agriculture, manufacturing, and services) that accompanies the process of modern economic growth”. Although often mainstream economists have tended to equate ST with sectoral shifts in output in this way, heterodox economists have never thought of economic structures solely in sectoral terms.

Kuznets and the early development economists had a much broader concept of ST. While sectoral shifts in production and employment from agriculture to industry played a key role in the analysis, they also identified other specific aspects of the structure of L&MICs. Kuznets (1966), for example, discussed the internal structure of the industrial sector, the type of enterprise, the distribution of income, the patterns of income use, and the share of foreign trade. Hirschman (1958) analysed the importance of intra-industry linkages.

The Latin American structuralists noted the structural heterogeneity within sectors as well as between sectors and pointed to the significance of technical progress and the uneven distribution of its fruits. Although they advocated industrialization, they also pointed to some of the problems associated with the lack of an integrated industrial structure, particularly the absence of a local capital goods industry and continued dependence on imports. Ownership of the means of

³ Critics have argued that the NSE, despite its name is essentially a neoclassical approach (Fine and Van Waeyenberge 2013; Aberg and Becker 2020). Indeed, Lin himself has stated that the main objective of NSE is to advance a neoclassical approach to the study of the determinants and dynamics of economic structures (Lin 2012, p.5).

⁴ “Latent” comparative advantage is indicated by the sectors which have been developed in countries with a slightly higher level of income and similar factor endowments.



production was also a key feature of structuralist analysis, both in discussions of agriculture (the *latifundio/minifundio* pattern) and in terms of the role of foreign investment.

It is now widely recognised that ST involves more than just sectoral changes in the composition of output and employment. The contrast between an industrialized North and an agricultural South no longer describes an international division of labour which is increasingly based on intra-industry rather than inter-industry trade and where specialization is in terms of tasks rather than type of product.

This broader view of ST considers the economic structure to include “the composition of production activities, the associated patterns of specialization in international trade, the technological capabilities of the economy, including the educational level of the labour force, the structure of ownership of factors of production, the nature of the development of basic state institutions, the degree of development and constraints under which certain markets operate” (Ocampo et al. 2009 quoted in Lectard et al. 2019). Similarly, Gollins and Kaboski (2024) point out that sectoral change is only one dimension of ST and that others include changes within sectors for example in firm size and type and the locus of economic activity, as well as broader changes in legal structures and political and social institutions.

In this context, it is useful to distinguish between three levels of a country’s productive structure at which ST occurs: macro, meso and micro. At the macro level there are sectoral shifts in production and employment between agriculture, industry and services. These are accompanied by growing rural–urban migration and changes in the distribution of income. There may also be significant changes in the composition of exports from primary commodities to manufactured goods and possibly services; and changes in the level of trade reflected in the openness of the economy.

Within the broader view of ST adopted here there are also meso-level changes within economic sectors. Successful ST involves a movement towards higher value products or more sophisticated functions generating higher value added, and the development of new branches of activity. The development of linkages between firms and industries which may be local or international are also aspects of ST as are the location of particular activities as a result of agglomeration. Changes in the distribution of production and employment between formal and informal sectors can also be regarded as part of ST.

At the micro level several further aspects of ST can be identified. These include changes in the scale of production, the level of productivity and the technological capabilities of individual firms. Changes in ownership between foreign, state or private domestic capital can also be considered an important dimension of ST.

A Theoretical Framework for Analyzing Structural Transformation

There is no single model of ST but rather a variety of contributions which identify a range of factors and some of the relations between them. The theoretical framework used here identifies four proximate causes of changes in an economy’s structure,



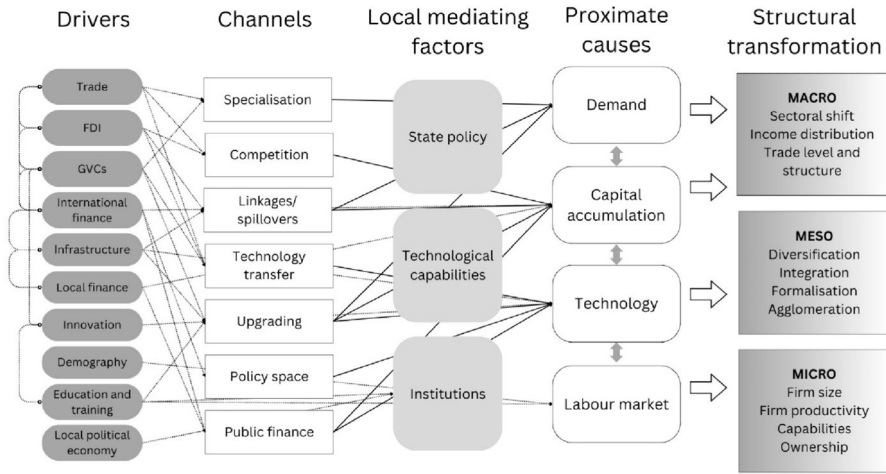


Fig. 1 Pathways of structural transformation. *Source* authors

broadly defined. These in turn are affected by a variety of underlying drivers which are mediated by local conditions, particularly technological capabilities, public policy and institutions (see Fig. 1).

Proximate Causes of Structural Transformation

Changes in demand play an important role in ST in both neo-classical and heterodox models of ST in terms of the size of the market and the level of per capita income. Differences in the income elasticity of demand for different types of goods lead to changes in the pattern of consumption as incomes rise (Sen 2023, Ch.2.2). Neo-classical interpretations tend to regard ST as a by-product of growth and changes in demand as a channel through which higher incomes lead to ST. In contrast heterodox approaches see changes in demand spurring growth by reallocating resources to increasing returns activities and promoting technological progress (Araujo and Teixeira 2021). Changes in demand also affect the labour market through its short-term impact on the level of employment and in the longer term demand for different skills.

Capital accumulation plays a central role in most analyses of ST, going back to Lewis' canonical work. The sectoral distribution of accumulation determines the shifts in the pattern of output with the emphasis being put on accumulation in the manufacturing sector by heterodox economists. Profitability plays a key role in determining both the rate and pattern of accumulation and there is a circular relationship between investment, technical change, productivity and profitability so that the rate of accumulation is linked to other causes of ST (Weiss and Jalilian 2021, Fig. 6.1). Technological change increases with the rate of accumulation as more advanced technologies are incorporated into production. Effective demand is



affected by the level of investment while labour market conditions also reflect the rate of accumulation.

Technology can lead to ST in two main ways. Differential rates of technological change cause differences in productivity growth between and within sectors which affects the structure of production at the macro and meso levels (van Neuss 2019, Sect 3.1).⁵ Changes in technology can also affect input–output relations and hence the distribution of output at the meso level (van Neuss 2019, Sect. 3.2). Technological change also has an impact on aspects of ST other than sectoral shifts. For instance, at the micro level, it leads to increased productivity levels and potentially increased international competitiveness. It may also influence the scale of production and hence firm size. Technological change also affects other determinants of ST. The introduction of new technologies raises profitability and this can lead to an increase in capital accumulation. It also affects the labour market through changes in the level and skill composition of the demand for labour.

Finally, changes in the labour market can lead to ST. The early development economics models of ST were based on an assumption of surplus labour which allowed labour to be transferred from the traditional to the modern sector. This highlights the importance of labour mobility in ST. Recent literature has looked at the way in which particular frictions may prevent or delay the reallocation of labour (Donovan and Schoellman 2023). The labour market also plays an important role in affecting other aspects of ST. At the macro level it is an important determinant of income distribution, while at the meso level it may play a role in the extent of formalization within industries. Changes in labour market conditions can affect all the other drivers identified here. Changes in wages have an effect on demand. Insofar as labour market outcomes have an impact on profitability, capital accumulation is affected, while changes in wages can also result in induced technological change.

Drivers of Structural Transformation

The proximate causes of ST identified above are in turn driven by a number of external and internal factors. Since the theme of this Special Issue is the BRI and its impact on participating countries, the focus here is primarily on the external drivers of ST and the channels through which they operate. However, these external drivers coexist and interact with several internal drivers that are also discussed here. Also crucially, these drivers are mediated through local conditions that play an important role in determining the extent and nature of the ST that occur.

Trade

Both economic theory and historical experience indicate the importance of international trade in ST. According to orthodox trade theory increased trade leads to specialization along the lines of comparative advantage which results

⁵ Neoclassical models of ST usually discuss this in terms of a relative price effect where exogenous differences in the rate of technological progress between sectors leads to changes in prices and hence reallocation of resources (Sen 2023, Sec. 2.2; Herrendorf et al. 2014, Ch.6.4).



in a reallocation of resources (Alessandria et al. 2021). Trade can also raise productivity through increased competition, better access to imported inputs and more advanced technology (De Loecker and Goldberg 2014). Historically trade played a major role in the transformation of economies from the industrial revolution in Britain to the East Asian newly industrializing countries in the twentieth century.

Foreign Direct Investment

There are very few studies that directly analyse the impact of foreign direct investment (FDI) and Multinational Enterprises (MNEs) on ST in L&MICs (Pinelli et al. 2021; Fu et al. 2011). These studies agree that FDI potentially has a significant effect on ST through several channels. It may lead to the development of new sectors either by substituting for imports or establishing new export activities leading to diversification of the economy and structural changes towards more dynamic sectors. Foreign investment can also be an important source of technology for southern countries, leading to increased productivity and greater competitiveness (Fu et al. 2021). Furthermore, foreign investment can lead to spillovers to domestic firms both horizontally to competitors and vertically to suppliers and customers (Pinelli et al. 2021, pp. 498–502). There is general agreement in the literature that the impacts on ST depend both on the type of FDI and local conditions in host countries including policies, institutions and technological capabilities (Fu et al. 2023).

Global Value Chain Integration

Some of the recent literature on ST has highlighted the role of integration into GVCs (Alessandria et al. 2024). The fragmentation of production that has been a feature of the development of GVCs has facilitated a greater level of specialization. The World Bank (2021, p. 3) claims that ‘GVCs are associated with structural transformation in L&MICs, drawing people out of less productive activities and into more productive manufacturing and services activities.’ This has been disputed by Rohit (2023) who finds that reallocation is towards less productive and dynamic sectors in L&MICs.

GVC integration can also contribute to other aspects of ST. There is an extensive literature on the potential for *upgrading* within GVCs (Humphrey and Schmitz 2002; Gereffi 2019). Integrating local production into GVCs can potentially trigger product, process, functional or inter-chain upgrading which help expand productive capabilities and close the gap to the global technological frontiers. It can also help stimulate local innovation and build up domestic R&D capacities. However not all insertions into GVCs bring about positive outcomes for learning and technological upgrading. As in the case of FDI, this will depend on the type of value chain and its governance and local technological capabilities, policy and institutions (Lombardozi, 2021; Sampath and Vallejo 2018).



International Finance

Griffith-Jones and Ocampo (2021) identify two key links between finance and structural change. Capital flows other than FDI, if able to provide subsidized high-risk and long-term credit for strategic productive investments, can constitute a key driver of capital formation and therefore achieve the objective of output and export diversification (Kaplan 2021; Gabor 2021). A second link is that stable flows of international capital can avoid boom-bust cycles that are disruptive to efforts to transform the economies of the Global South. International finance (together with local sources) can also play a crucial part in supporting the development of infrastructure which is required for ST. Adequate public finance is also important in providing the policy space for the state to bring about ST. Again, local policies and institutions have a key role to play in determining whether or not international finance is used productively or simply leads to increased indebtedness and becomes an obstacle to ST (Griffith-Jones and Ocampo 2021).

Infrastructure

Hard infrastructure, namely the ensemble of utilities, public spaces, and transport, has played a key role in countries' ST (Lin 2012; Lin and Wang 2017a, b). Infrastructure is instrumental in enabling rapid exchanges of goods and in reducing trade costs to intensify international and domestic trade. As observed during the recent wave of globalization that began in the 1970s, internet and ICT technologies as well as container shipping and railway development have led to rapid growth in the trade-to-GDP ratio and contributed to reducing poverty (Dollar and Kray 2004). Improvements in infrastructure also affect other drivers of ST, making a country more attractive to FDI and facilitating insertion into GVCs through improvements in transport, communications and energy supplies.

In addition to reducing trade costs, construction may contribute to ST by creating linkages both to suppliers of inputs such as cement and building materials and through demand linkages from increased local employment and wages (Rameezeden and Ramachandra 2008). By removing bottlenecks and reducing supply disruptions, infrastructure development can also help increase industrial productivity and promote industrialisation (Azolibe and Okonkwo 2020).

Domestic Drivers of ST

Infrastructure could be regarded as an internal driver of ST but was included above with other external drivers because of the important role that it plays in the BRI. There are several other internal drivers that should be mentioned here. Foreign finance only contributes part of the total resources channeled into capital accumulation locally and the scale and allocation of domestic finance also plays a major role in ST. Local financial institutions, particularly national development banks, have an important role to play in channeling both domestic and international finance to promote ST including through infrastructure construction and support for innovation (Griffith-Jones and Ocampo 2021).



Local innovation contributes to efforts to narrow the technology gap to the international frontier. There has been increasing recognition of the importance of local efforts which may involve incremental innovation in L&MICs (Dutrénit 2013). The National System of Innovation approach emphasizes the importance of the broader national picture in determining the results of these efforts.

Demographic factors including the rate of population growth, the age structure of the population and migration affect labour market conditions and ST within a country (UNCTAD 2018). Education and training also have an important bearing on the supply of labour as well as affecting local technological capabilities.

Finally changes in the local political economy can play an important role in ST (Martinez-Bravo and Wantchekon 2024). The emergence of new political coalitions and changes in the regime in power can trigger ST. The literature on the role of the developmental state indicates the importance of differences in the local political economy (e.g. the balance of class forces, state-business relations, and the degree of state autonomy) in bringing about industrialization (Amsden 1989; Evans 1995; Jenkins 1991; Khan and Blankenburg 2009; Storm 2017). They affect government policies and local institutions which play a key role in mediating the various drivers of ST discussed above.

Local Mediating Factors

The internal and external factors identified here do not necessarily lead to ST and if they do, the changes that occur are not necessarily positive in terms of development outcomes. Increased trade can lead to deindustrialisation and over-specialisation in a narrow range of commodities (Rodrik 2016). This can be reinforced if the infrastructure that is built is geared solely to resource extraction. Participation in GVCs does not necessarily lead to upgrading and has in some cases led to downgrading or had little effect (Gereffi 2019). FDI flows can lead to the crowding out of local capital and a reduction in local technological capabilities (Morrissey and Udomkerdmongkol 2012) Increased foreign finance causes indebtedness that may in the long run lead to greater dependence on foreign lenders and reduce rather than increase policy space.

These considerations highlight the importance of local conditions as mediating factors in terms of the impacts of the various drivers on ST. Three aspects are particularly important here: state policy, technological capabilities, and institutions.

The state can play an active role in promoting structural change in the economy (e.g. Rodrik 2007; Chang 2015). It is capable of shaping the direction of ST through coordinated actions in infrastructure, social security, R&D, technology and employment creation (Spence 2021). Studies of past and present experiences of industrial policy have shown that it can be a successful tool in the hands of the state to shape the direction and pace of development (Andreoni and Chang 2017; Storm 2015; Ocampo et al. 2009; Lin and Chang 2009; McMillan and Headey 2014; McMillan et al. 2014). In some cases, public institutions such as development banks and Sovereign Wealth Funds (SWFs) have been able to carve out some space and provide long-term credit with favourable interest rates to finance assets that are



unappealing to private investors (Alami and Dixon 2021; Kaplan 2021). Lastly, the state can be a direct producer of ST through state-owned enterprises (SOEs) or sovereign wealth funds (Alami and Dixon 2020) but also through, monetary policy, managing capital flows and fiscal policy.

A second factor affecting the impacts of a number of drivers on ST is the level of local technological capabilities. Numerous studies of FDI and GVC impacts on L&MICs have found considerable heterogeneity in terms of development impacts. These are often attributed to differences in absorptive capacity which in turn reflect differences in local technological capabilities. (Fu et al. 2011; Sampath and Vallejo 2018). This affects the extent to which host countries can share in the gains from technological progress and potentially narrow the gap to the technological frontier. It also determines the potential for local producers to move up the value chain in terms of product and functional upgrading.

Institutions, broadly defined, can also affect the way in which various drivers contribute to ST. Much mainstream economics gives pride of place to institutions such as the rule of law, political stability, regulatory quality as determinants of economic performance generally (Acemoglu et al. 2005; Lloyd and Lee 2018). In contrast a heterodox approach sees the economic structure as central and institutions reflecting the existing structures. There is a bidirectional relationship between ST and institutions rather than a unidirectional effect of institutions on growth (Constantine 2017).⁶ The framework used here recognizes that these factors can affect ST positively or negatively but sees them rather as intervening factors that affect the way in which the underlying drivers play out.⁷ Figure 1 summarises the framework presented in this section.

The potential Channels Through which BRI Promotes Structural Transformation

Since the impact of the BRI on ST in the Global South has not been covered in any depth in the literature, this section examines the evidence on how the BRI has affected the drivers of ST identified in the previous section.

The BRI, Infrastructure Connectivity and Structural Transformation

As was noted earlier, infrastructure connectivity is one of the main priorities of the BRI and China has devoted considerable resources to building infrastructure in and across BRI countries. It has been estimated that 90% of Chinese construction abroad between 2014 and 2019 was in countries involved in the BRI (Scissors 2020, p.5).

⁶ Constantine (2017) points to the way in which economic structure affects income distribution which in turn affects political power that then leads to changes in institutions. The focus of this study is on the determinants of ST and it does not therefore discuss these feedback mechanisms in any detail.

⁷ This is somewhat different from the approach adopted by McMillan and Rodrik which combines fundamentals (which include institutions) and ST in explaining development outcomes, McMillan et al. (2017).



The impact of changes in transport infrastructure is found to vary across countries and regions. For instance, Chen and Li (2021) find that southeast Asia stands to benefit from the BRI, while Central Europe does not. Within southeast Asia, Lao PDR and Cambodia will see a small GDP increase (0.04–0.17%), while Vietnam and Thailand are likely to be worse off (loss in real GDP at around 0.02–0.03%; Chen and Li 2021).

Empirical studies have found that BRI infrastructure increases trade overall (Baniya et al. 2020; Cui and Song 2019; Konings 2018; World Bank 2019; Yu et al. 2020).⁸ Several studies have estimated that BRI transport infrastructure projects will lead to a significant reduction in shipment times and trade costs for the countries involved. De Soyres et al. (2019) conduct *ex-ante* estimates of the impact of the BRI on trade costs and times. They find that BRI countries will see an average reduction of around 1.5–3% in both trade times and costs. Gains will be largest for countries along BRI corridors, which will see these figures decline by up to 10–12%. These gains in trade times and costs can lead to economic benefits. The World Bank (2019) estimates an increase in global trade between 1.7–6.2%, with a corresponding increase in global real income between 0.7 and 2.9%. It should be flagged that these gains are all calculated *ex ante*, and therefore are based on strong, and not necessarily verified, assumptions: that projects are completed, that there are no changes in the current plans and so on. For instance, De Soyres et al. (2019, p. 157) find that Kenya's gains from the BRI depend not only on the infrastructure improvements in Kenya, but also on the progress made by the railways in Myanmar, Thailand and Pakistan, as well as the port projects in Kyaukphyu (Myanmar) and Gwadar (Pakistan).

The Digital Silk Road, or the iteration of the BRI focussed on Information and Communication Technology (ICT) has enhanced digital infrastructure connectivity through the deployment of advanced technologies such as big data, smart cities and cloud computing, but also through the deployment of ICT investment in many L&MICs. While this can potentially promote knowledge transfer and upgrading (see for example Ambalov and Heim 2020), the evidence that any upgrading takes place is weak, as demonstrated by el-Kadi (2024) in her analysis of the impact of Chinese companies ZTE and Huawei in Algeria and Egypt. Other programmes, such as the Space Silk Road (Sun and Zhang 2016), and the Health Silk Road (Yuan 2023), focussing respectively on cooperation in space technologies and health, have similar potential, but so far there is little evidence of their impact on technology and knowledge transfer, and ultimately on ST.

The deployment of Chinese labour for infrastructure projects (and more in general in Chinese companies in L&MICs) may have a negative impact on knowledge and technology transfer. However, several studies have looked at the localisation of labour in Chinese investment and infrastructure across the globe, and found generally high (upward of 60–80 or even 90%) and rising localisation rates (i.e. the share of local workers in the total workforce; Oya and Schaefer 2019).

⁸ Most studies look at the overall impact of participation in the BRI but one study by Ramasamy and Yeung (2019) separates out the impact of infrastructure and trade facilitation on exports and concludes that both increase trade but that the impact of trade facilitation has been the more significant of the two.



Despite its potential significance, there has been little research on the productivity effects of Chinese infrastructure projects. Yang et al. (2020) is one of the few BRI studies that estimate these effects but then only at the aggregate level. They estimate GDP growth rates to increase considerably in South, Southeast, Central Asia and Russia (2.5–8%), while the Americas and Europe will see GDP growth rate growing by less than 1%. There are no studies that explicitly analyse the backward linkages from BRI construction projects to other industries such as building materials.

Although infrastructure construction can play a major role in ST, the outcomes depend on the type of infrastructure and the context in which it occurs. The aggregative nature of the existing literature and the neglect of important issues such as the effect on industrialisation through increased productivity and backward linkages means that so far little is known about the structural impacts of BRI infrastructure projects.

The BRI, Trade, GVC Upgrading and Structural Transformation

One of the ways through which the BRI can lead to ST is via the growth of trade. The emphasis on infrastructure connectivity and unimpeded trade that constitutes two of the BRI's priorities have the potential to increase trade, particularly trade between China and BRI participants. Some aspects of the BRI, for example, the construction or expansion of ports can increase a country's trade with all countries, whereas others such as the construction of pipelines are specific to trade between BRI countries. Cooperation amongst customs authorities and mutual recognition of standards are specific to trade between particular partners. Thus, the BRI has the potential for both trade creation and trade diversion.

Most of the studies that have analysed the impact of the BRI on trade look at the level of trade and do not consider the effects on the pattern of trade, although some recent studies have started to look at the impact of the BRI on trade in different types of goods (Wang and Tian 2022). However, from the point of view of ST, the implications for the composition of a country's trade are crucial. For example, the New Structural Economics argues that reductions in transaction costs of the kind that the BRI is designed to bring about enable countries to take advantage of their "latent comparative advantage" (Lin and Wang 2017a, Box 2.2). In other words, to increase exports from sectors where the country's factor endowments give it a comparative advantage but where high transaction costs prevent firms from being internationally competitive.

However, the changes in the structure of trade brought about by the BRI do not necessarily contribute to deepening domestic industrial development and may in some circumstances lead to deindustrialisation.⁹ Studies that have disaggregated

⁹ Although not specifically focussed on the BRI, Nedoncelle and Wolfersberger (2023) find the trade with China has had a negative impact on structural transformation in developing countries. Countries that are more industrialised, such as South Africa, may face competition from Chinese imports (e.g. see Torreggiani and Andreoni 2023) but other countries find that Chinese imports of intermediate goods and equipment can be instrumental in kickstarting the industrialisation process (for a review, see Calabrese and Tang 2023).



the impact of the BRI on trade by sector find that these are not uniform across sectors and that there is also considerable regional heterogeneity (World Bank 2019, Table 2.2; Baniya et al. 2020). For instance, the World Bank (2019) estimates that Africa will see increases in agricultural and manufacturing trade (+2.6% and +1.6% respectively) and a 2.2% decline in trade in services. A simulation study of Central Asia found that whereas the manufacturing sector grew in the more industrialized countries as a result of the BRI, it was expected to contract in Kyrgyzstan, Tajikistan and Turkmenistan (Bird et al. 2020).

Similarly, while positive ST is associated with economic diversification, increased trade, based on existing comparative advantage, tends to lead to greater specialization. The outcomes for individual countries will depend on the activities in which they have a comparative advantage and the extent to which the state intervenes to modify the outcomes of expanded trade.

Changes in a country's position within global or regional value chains through product, process or functional upgrading is an important aspect of ST. The BRI Action Plan explicitly refers to the need to "improve the division of labour and distribution of industrial chains by encouraging the entire industrial chain and related industries to develop in concert" (PRC 2015). However, the latest BRI White Paper, published after the Covid-19 pandemic, stresses the importance of stable supply chains (SCIO 2023). What then are the changes to GVCs that are being brought about by the BRI, and are they increasing the opportunities for upgrading in participating countries?

There is little doubt that several of the cooperation priorities of the BRI could potentially promote greater integration into GVCs, particularly those in which China plays a leading role. Infrastructure connectivity reduces the cost of transporting goods which is crucial for integration into GVCs, particularly for landlocked countries, and the costs of communication through the development of IT facilities that are required to ensure coordination of dispersed manufacturing activities. The establishment of Special Economic Zones (SEZs) played a key role in the initial phases of China's integration into GVCs (Zhang et al. 2020) and is also a feature of the BRI. The facilitation of trade and investment can also contribute to integration into value chains as do the establishment of technical standards and greater policy coordination.

Several empirical studies have analysed the implications of participation in the BRI for integration into GVCs with mixed results. Wu et al (2020) found that the BRI had a positive impact on GVC integration although the results were heterogeneous so that when developing and developed countries were considered separately, the impact was only evident amongst the former. Zheng et al. (2021) also found that impacts differed between regions but in their study, the positive cases were in Central and Eastern Europe. Several Chinese studies cited by Zheng et al. (2021) also found that results varied across countries, while Wu et al. (2020) refer to examples of individual country studies showing an increase in integration as a result of the BRI. Ge et al. (2020) argue that weak institutions in BRI countries are an obstacle to participation in GVCs while Wang and Zhong (2023) find that Chinese outward FDI plays an important role in integration into GVCs, particularly in countries with weak institutions.



As mentioned earlier participation in GVCs does not necessarily lead to upgrading, so that even in those cases where the BRI has led to greater integration of production, it cannot necessarily be assumed that it has contributed positively to ST. The extent and nature of the effects of the BRI through this channel remain an open question. Industrial policies have a role to play in capturing the benefits of integration into global value chains.

The BRI and FDI Flows

There are several channels through which the BRI could promote FDI. Infrastructure projects do in some cases involve a long-term commitment by Chinese firms that qualify as direct investment. By reducing the cost and reliability of energy, transport and communications, improved infrastructure makes a location more attractive to foreign investors promoting capital flows to other sectors (Chen and Lin 2020). The BRI Action Plan (PRC 2015) commits to “speed up investment facilitation, eliminate investment barriers, and push forward negotiations on bilateral investment protection agreements and double taxation avoidance agreements to protect the lawful rights and interests of investors” which would when implemented increase FDI flows. It has also been suggested that it is easier for Chinese firms to obtain investment approval and to get it more quickly where projects can be classed as BRI-related transactions (Hillman 2018, p. 3). Finally, there is a signalling effect of participation in the BRI indicating a strengthening of a country’s political relationship with China that could reduce the perceived risks for investors (Du and Zhang 2019; Xu 2020).

Several empirical studies have concluded that the BRI has led to increased Chinese FDI in the countries that were initially covered by the initiative (Du and Zhang 2019; Yu et al. 2019; Chen and Lin 2020; Sutherland et al. 2020; Xu 2020). In terms of the mechanisms involved, Chen et al. (2020) find that for every 1% increase in investment facilitation levels, BRI countries can potentially see a 2.2% increase in Chinese FDI. Some studies have pointed to the heterogeneous response of foreign investors and in some cases challenged the claim that the BRI has increased the overall level of Chinese FDI (Kang et al. 2018; Nugent and Lu 2020). Xu (2020) shows that the BRI reduces the political risk for Chinese investors.

The extent to which FDI promotes ST depends on the specifics of that investment in terms of the sectors targeted, the nature of the technology and the absorptive capacity of the host country as well as on government policies. Unfortunately, the focus of most studies on the impact of the BRI on aggregate FDI flows means that there is very little information on the issues that are critical for analysing the implications for ST.

Studies that have looked at the sectoral impacts of FDI have done so at a relatively broad level. One study finds that market-seeking FDI was boosted by the BRI while natural resource-seeking investment was not and may have been negatively affected. However, this was based on the country distribution of FDI and did not provide evidence of the actual sectors in which the investment occurred (Kang et al. 2018). Another study argues that Chinese firms in construction and infrastructure,



manufacturing, and trade-related sectors are more responsive to the BRI than those in other sectors (Yu et al. 2019). Finally, Nugent and Lu (2021) find evidence that the BRI boosted investments by firms from sectors in China characterized by high levels of overcapacity or pollution while noting the need for more research on the BRI's impact on a participating country's economic structure.¹⁰

These studies do suggest that the BRI may have contributed to ST in participating countries. However, more detailed empirical research is required at sectoral and firm levels to explore the mechanisms and impacts of the BRI in terms of technology transfer and spillovers.

BRI Finance, Policy Space and “Patient Capital”

The BRI involves a major financial contribution from China. There are no official figures on the total amount of Chinese finance for the BRI and unofficial estimates vary from US\$ 600 billion to over a trillion (Parks et al. 2023). There is no doubt however that China has become a significant source of additional development finance for the countries that form part of the BRI (Liu et al. 2020b). Financial integration is one of the cooperation priorities of the BRI and there is some empirical evidence that countries that sign up to the BRI have received significantly more loans from China than those that have not (Zhang and Fang 2020).

Additional finance associated with the BRI could contribute to ST not only directly in terms of the resources that it brings but also through the creation of more “policy space” for participating governments. Many countries in the Global South have in the past found their ability to adopt policies for ST, particularly trade and industrial policies, constrained both by a lack of finance and by conditions imposed by the Bretton Woods institutions and Western donors. Chinese finance however has avoided such policy conditionality and has been more willing to respond to the policy priorities of their Southern partners (Alshareef 2023). This has increased the scope for policies of ST for governments that are committed to alternative development strategies, although it can also be used to promote clientelism and unproductive expenditure.

Another aspect of the BRI that may contribute to ST is the involvement of so-called “patient capital” in financing the BRI (Lin and Wang 2017b; Kaplan 2021). The Chinese policy banks and State-Owned Enterprises (SOEs) are less subject to the short-term profit requirements that characterise private businesses and are therefore more able to take the long-term view that is essential because ST requires many years to achieve and may not give investors an immediate return.

There is also a potential downside if increased indebtedness as a result of BRI finance is not sustainable (Bandiera and Tsiropoulos 2020; Hurley et al. 2018). This could in the longer term reduce policy space for indebted countries, for many of which China is among the largest bilateral lenders. The most extreme version of this view claims that China is deliberately promoting excessive indebtedness as a form of “debt-trap diplomacy” to gain control over the assets of countries and to increase

¹⁰ The sectoral classification were based on the sectors in which a firm operated in China rather than in the host country.



its political influence. These claims have been challenged and there is evidence of flexibility on the part of China in terms of debt restructuring (Brautigam 2020; Jones and Hameiri 2020; Singh 2020). China's participation in the Common Framework for debt restructuring, for example, has improved chances for indebted countries, but actual progress on restructuring has been slow.

The cooperation priorities of the BRI have the potential to bring about ST in the Global South. However, it is also clear that this is not automatic or inevitable and that ST, will not occur without other conditions and policies. In the absence of appropriate policies then ST is unlikely to occur, or may even be regressive, reinforcing dependence and specialization.

Introduction to the Articles in this Special Issue

This special issue addresses the question of ST in the context of the BRI. The contributions in this issue highlight a complex web of factors and drivers that affect how the BRI supports ST. The articles consider ST at different levels. They include macro studies that look at sectoral changes and specifically the contribution of the BRI to industrialization. One study is primarily focussed on the meso-economic level looking at changes within a particular sector, while another has a microeconomic focus on technology transfer, learning and firm performance. They also adopt a variety of methodological approaches including panel data econometrics, comparative political economy and studies of individual country experience. Several articles focus specifically on the impact of Chinese infrastructure projects while others take a broader view to include other aspects of China's engagement such as loans or FDI.

In their article on ST in Africa, Weiping Li and Saite Lu employ econometric analysis to assess the impacts of China's existing infrastructure projects on ST at the macro level in Africa. They analyse the effect of Chinese contract on the share of manufacturing and on the labour market in 53 African countries. To our knowledge, their study is the first to combine longitudinal data on employment and economic structures jointly developed by the Groningen Growth and Development Centre (GGDC) and the World Institute for Development Economics Research (WIDER), with Chinese contract data produced by the China-Africa Research Initiative. They find that Chinese infrastructure projects in Africa have contributed positively to industrialisation and employment creation in African countries, thus signalling a positive impact of the BRI on ST. They also show that policies and institutions as measured by regulatory quality play an important role in affecting the outcomes.

The article by Christina Wolf also looks at the impact of infrastructure projects in Africa. She analyses Chinese construction projects in Angola, Nigeria and Ethiopia, the countries that registered the highest cumulative value of construction projects completed by Chinese firms in sub-Saharan Africa between 1998 and 2018. As with Li and Lu her focus is on the macro aspects of ST in terms of the impact on industrialization. In the three case studies, she finds that Chinese construction projects were an important catalyst for ST through several channels: they relieved infrastructure bottlenecks and created demand for construction materials, thus



spurring domestic manufacturing development through backward and forward linkages and second-round demand multipliers. Wolf's article also shows that domestic political economy dynamics determine the nature of the accumulation processes and thus affect the ST process. In each of the countries, the domestic distribution of power shaped the way the gains were sustained and distributed, demonstrating the importance of industrial and other economic policies and the maintenance of political stability.

A third article that analyses infrastructure projects in Africa, this time of a single country, is Yunnan Chen's article on railways in Ethiopia. In contrast to Wolf, Chen finds that backward and forward linkages from Chinese rail projects have been weak. She highlights transformation at the micro level as a result of knowledge transfer associated with Chinese infrastructure construction. Compared to Turkish-constructed, commercially-financed rail projects, Chen finds evidence of technology transfer in both projects with strong involvement of the construction contractors. While Chinese development finance brings a more holistic package of technology transfer, this has also been limited, posing barriers to long-term capacity building and autonomous infrastructure development. The failure to achieve all the potential benefits from the projects in terms of stimulating industrialization and ST reflects specific policy decisions by the Ethiopian government regarding local content, the low level of local technological capabilities and political instability and civil conflict.

Two articles analyse the impact the BRI in Central Asia. Linda Calabrese takes a broad view of Chinese involvement, including loans and FDI as well as projects specifically identified as part of the BRI in her study of the Kyrgyz Republic. As with several of the other papers, her focus is on the macro level. She finds that, while the BRI could potentially support industrialisation, in practice it has failed to do so. Using the New Structural Economics framework, the author suggests that in the context of Kyrgyzstan's open market policies and regulatory state, the BRI's infrastructural offer should, in theory, be able to kickstart ST—but instead, the country is experiencing a shrinking of its manufacturing sector. The reasons for this are to be found in the role played by the Kyrgyz government which, in contrast to the government of Ethiopia, lacked a strong commitment to industrialization. The absence of a strategic approach to industrialisation, meant that the channels which potentially link the BRI to industrialization, for example through backward and forward linkages or channelling of resources to the industrial sector were not utilized in Kyrgyzstan. This was due to both internal factors (limited capacity and the rentier nature of the state) and external ones (pressure to comply with donors' neoliberal advice). This suggests the need to reframe theories of ST around the role of the state, deemed to be critical in delivering industrialisation.

Lorena Lombardoizzi adopts a GVC approach to analyse the impact of the BRI at a meso-economic level. Her study of the Uzbek gas industry considers whether the BRI has led to product, process and institutional upgrading. The BRI's impact in Uzbekistan's gas sector has come mainly through Chinese loans and contractors and increased trade with China rather than FDI. As a consumer, China has reconfigured the geo-economic matrix around gas, which might change regional power relations. As a lender and producer, China contributes to national infrastructure development.



However, the author concludes that the BRI and economic engagement with China has only contributed marginally to organisational, skills and product upgrading in the Uzbek gas sector. A coordinated industrial strategy coming from the Uzbek state remains a necessary condition for ST.

Not all articles, however, identify a positive connection between the BRI and industrialisation. In the case of Malaysia, Guanle Lim and Andrew Kam find that Chinese foreign direct investment has been focused on the tertiary sector. This has the adverse effect of placing less emphasis on industrialisation. In other words, economic engagement with China has prompted ST in Malaysia, but this is geared towards an increased emphasis on services in the economy. Moreover, the services-heavy nature of Chinese investment translates to a low economic multiplier effect, while creating negative social impacts in the country.

While most of the attention so far has been devoted to the host country context, Chinese drivers and capital also matter for ST. Nicholas Jepson and Oyuna Baldakova explore this topic through a comparative lens. Using the ‘varieties of capitalism’ framework, the authors look at the extractive sectors in Kazakhstan and Bolivia to ask whether engagement with Chinese state capital creates greater space for industrial policy. As both Kazakhstan and Bolivia are making efforts to move into domestic downstream processing of extractive commodities, the authors find that Chinese state capital is more accommodative of local aspirations for extractive value addition than other sources of finance. The degree of flexibility, however, is influenced by overarching drivers of the BRI, such as the export of domestic overcapacity, concern for resource security and fostering of political relations.

Conclusions

In conclusion, through these articles this special issue has tried to expand—both empirically and theoretically—the understanding of the BRI-related dynamics and impacts on ST in LMICs. These have encompassed a distinctive focus on domestic institutions that regulate and coordinate production diversification, national and international sectoral specificities, and characteristics of the drivers and barriers to technological innovation and trade. Although it is not exhaustive of the realities in which the BRI is deployed in the Global South, it has covered a diverse set of regions, sectors and political settings which were in many cases underexplored.

Two sets of reflections can be drawn from this exercise. The first one is simultaneously empirical and methodological. These studies show that the patterns of ST are heavily context- and time-specific, with local political economy dynamics playing a key role. By the same token, the studies highlight the importance of local agency in the ST process. It is worth noting that in some instances, the BRI and economic engagement with China do not support ST, but rather create hindrances to the process. These articles have therefore highlighted the necessity to look not only at macro patterns but also at micro and meso levels of analysis, which offer insightful perspectives to identify what variables cause barriers to STs.



Another contribution coming out of the findings presented in this special issue is that the BRI has to be studied for its relational dimension rather than a top-down force in which the recipient countries hold a neutral position. Indeed, the host countries' internal dynamics have occupied a central role in the analysis of the impact of BRI for ST. Nonetheless, within this diversified and contested political context, findings also suggest that there is more than one channel in which the BRI could support ST: either by promoting structural change, and in particular industrialisation, or by allowing technology transfer, capability building and upgrading to take place. Hence, it is important to consider the political and institutional characteristics that shape Chinese operations on the ground.

The second set of reflections is related to the theories and policy agenda for development. In particular, this special issue has shed light on the contribution that a heterodox lens can bring to the understanding of ST in the context of BRI. The diverse heterodox frameworks adopted in the various articles have gone beyond the mainstream quantitative assessments of the BRI in terms of higher GDP, trade or welfare. Instead, a multidimensional and inter-scalar analysis of ST has allowed the identification of the drivers, both on the Chinese and the host country sides, and the distinctive characteristics of organisations and structures of production that enable development. In particular, industrialisation policies or unintended deindustrialisation, political and financial instruments to enable ST, domestic systems of incentives as well as a focus on the distribution or unevenness of gains are shown to be crucial variables.

Finally, from a policy perspective, these studies confirm the importance of industrial policies in turning any form of foreign inflow of capital into virtuous incremental changes. Further research is needed to provide policymakers with the right tool to turn not only the BRI but also similar infrastructure initiatives, such as the G7's Partnership for Global Infrastructure and Investment and the EU's Global Gateway, into effective development tools. More broadly, there is very little emphasis on the impact of BRI projects on the entirety of host countries' economies (beyond specific narrow effects). The framework developed here can support policymakers in understand through which channels BRI projects can be transformative.

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